THIRTY-FOURTH ANNUAL REPORT

OF THE

SOUTH CAROLINA

STATE BOARD OF FISHERIES

YEAR ENDING JUNE 30, 1940

TO THE

GOVERNOR AND GENERAL ASSEMBLY

1940

PRINTED UNDER THE DIRECTION OF THE
JOINT COMMITTEE ON PRINTING
GENERAL ASSEMBLY OF SOUTH CAROLINA

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REPORT

To His Excellency, the Governor, and the Honorable General Assembly of the State of South Carolina, Session 1941:

The State Board of Fisheries respectfully submits herewith, its thirty-fourth Annual Report.

This Board is charged with the duty of enforcing all laws pertaining to the commercial fisheries industry of South Carolina. It has jurisdiction of all State owned oyster beds and bottoms, and supervision of all fish and shellfish removed from their natural habitats for commercial purposes. South Carolina's fisheries industry is composed in the main of our shad, sturgeon, oysters, clams, terrapin, menhaden and shrimp, although other salt water fish such as mullet, sea bass, trout, flounders, sheepshead, etc. are taken from our waters and marketed successfully.

Through this report each year we endeavor to bring before you many pertinent facts concerning the value and importance of our fish and shellfish industries. However, it is most difficult to write a yearly report that is interesting to the layman, and yet at the same time give you a comprehensive picture of the true facts through the principal medium in which we deal—namely, figures. A good year or a bad year is determined for us by—plain figures. Even in discussing the conservation and development of our natural resources, we discuss them in terms of figures.

Each year we endeavor to build up the catch of fish and shellfish, yet at the same time we endeavor as well to build up an adequate supply for the next year and the year after, by, for instance, strict enforcement of such laws as that governing the minimum limit on the size of fish that may be taken; the culling law to avoid the marketing of undersized oysters, and by replanting each spring thousands of bushels of oyster shell and seed oysters in order that we may continue to have an adequate supply of oysters. In this connection also, the Legislature has set minimum sizes of mesh for various kinds of nets and limited their use to one-half the width of any stream in which they might be used.

We shall, in this report, attempt to touch upon each of the various phases of our work, as well as render you a report covering the activities of each open season.

The personnel of the department has remained the same during the past fiscal year. Mr. J. M. Witsell, Walterboro, continues to head the department as Chairman of the Board. Dr. W. B. Ryan, Jr., Beaufort and Mr. W. P. Lewis, Aynor, constitute the other members of the Board. Mrs. Louise M. Bussey, Charleston, serves as Secretary, and Mr. Alonzo B. Seabrook, North Charleston, as Chief Inspector.

All laws pertaining to the commercial fish and shellfish industries of South Carolina are assembled and printed each year in a small booklet which is entitled, "Laws of the State of South Carolina—Pertaining to Shellfish and Migratory Fish," copies of which are at all times available upon request, without cost.

SHAD

The shad is a fish of superior flavor. In season it is in greater demand than perhaps any other fish and the entire catch is consumed in the fresh state.

Today the shad is probably the best known and most highly prized fish on the Atlantic coast of the United States. It is much less numerous now than formerly in some of the streams, and from others it has almost disappeared because of the construction of dams and because of pollution from cities and industrial centers. The shad is anadromous, entering the sounds and bays from the sea and ascending fresh water streams to spawn. It spawns very soon after reaching fresh water, and if not caught in the fisheries, returns to the ocean after spawning. A single female ordinarily produces 25,000 to 30,000 eggs. The eggs are relatively large, being about 3 millimeters in diameter. The eggs generally hatch in from 6 to 10 days, the young at hatching being about 10 millimeters long. They grow quite fast and by the end of the first summer, when the young migrate to the ocean, their average length is about three inches. After migrating to the sea they are generally not seen again until they return as adult fish to spawn. The location of their home in the ocean is still unknown.

Relative to the nutritive value of shad, the United States Bureau of Fisheries has this to say:

"Shad possess the same general food properties that are commonly attributed to fishery products. In general, fishery products are an excellent and economic source of easily digestible proteins, a good source of vitamins, and an excellent source of minerals in quantity and variety. The flesh of the shad includes nineteen per cent protein, nine per cent fat, and such mineral nutrients as calcium, phosphorus, copper, iodine, and sulphur. Vitamins A and B also are found in the flesh of the shad."

In the Hudson River fishermen are catching more shad now than they ever did, even in the good old days before 1900, while in South Carolina and in other states as well, along the Atlantic coast, the catch has steadily declined. If we are to continue to have a shad industry, we must allow escapement of a sufficient number of shad each year. The fishermen of the Hudson River are required to allow enough shad to spawn each season. They have learned that it is more profitable to take 60% of a run of 5,000,000 pounds of shad than to take 90% of a run of 100,000 pounds, as they did twenty years ago.

We believe that what has been done in the Hudson can be done in the rivers of South Carolina, but only with the approval and the support of the fishermen. There will be opposition, of course, but one way of overcoming opposition is to make it clear that it is not necessary to give up 40% of the shad in order to let 40% spawn. The fishermen of the Hudson eventually catch 88% of all the shad that come to the river. But here is the important point. Of those that go out to sea again, most of them come back the next year. So the Hudson fishermen have a second chance at them. For that matter, the U. S. Bureau of Fisheries has found from studying the scales that they have a third, a fourth, and even a fifth chance at them.

The United States Bureau of Fisheries believes that it is impracticable to provide hatcheries on a scale large enough to replace natural reproduction. Chesapeake Bay, where since 1876 the numbers of fry planted have varied from about five to one hundred and fifty millions, has not shown any very impressive results. Yet the Hudson has shown a remarkable recovery where very little hatching, about 2,000,000 eyed eggs a year, has been done. In other words, the Bureau of Fisheries found that in the Hudson by fishing at the rate of 60% a year a catch of nearly as many fish as at a rate of 90% a year could be obtained and yet let more than six times as many spawn. Dr. R. A.

Nesbit states that, "we can let the fish spawn and catch more of them too if only we are not in such a rush that we insist on catching nearly all of them the first time they show up."

It was decided after consultation with, and upon the advice of experts connected with the U. S. Bureau of Fisheries, not to operate the Jacksonboro shad hatchery this year. While it cannot be stated that artificial propagation has been a failure, it cannot be maintained either that it has increased or even maintained the supply of shad. However, insofar as the supply of eggs for hatching has been obtained for the most part on a purely salvage basis, it would appear that such propagation is worthwhile for the simple reason that the eggs would have been wasted had not they been taken by hatchery attendants and hatched in the protecting environment of glass jars. However, with the continued decline in the shad catch it was deemed best to suspend hatchery operations temporarily at least, and endeavor to have passed by the General Assembly certain laws which it is felt will more adequately protect and build up the shad supply.

In South Carolina, as in many other regions, the open season for commercial shad fishing does not correspond to the best time to obtain ripe eggs for hatching purposes. Therefore, it has been necessary, to keep the hatchery in operation, to extend the fishing season to a limited number of fishermen in an attempt to obtain sufficient eggs to justify the maintenance of the hatchery. Such a policy has meant that shad which are ready to spawn naturally and return to sea until the following year, are sacrificed in order that the hatchery could be operated. It appears more worthwhile to allow all shad escaping from the fishery to spawn naturally and to return again the following year or years, rather than to pursue the debatable policy of catching the limited number of remaining fish in order that a relatively small number of eggs could be hatched artificially. Other methods appear from a conservation standpoint to be more practical.

For example, it would be more desirable to maintain a greater space between set gill nets and reduce the nights of fishing each week from four to two. By maintaining a greater space between nets, we would automatically somewhat reduce at least, the number of fishing gear in each river. In addition to the two measures above suggested, we earnestly request that the open season on shad fishing be changed to from February 1 to March

25 and that THIS OPEN SEASON APPLY TO THE ENTIRE STATE. The present law allows fishing above the forty mile limit at the time when the majority of the roes are ready to spawn and keeps open to fishermen the natural spawning grounds of the shad in South Carolina. It is, in our opinion, most important that as many shad as possible be permitted to spawn at least once. If a sufficient number of them can do this, the stock of shad will increase in due time. Until we do allow a greater number of shad to escape capture and deposit their eggs naturally, other efforts to bring back the supply will be quite useless. Since the hatcheries have not replenished the supply, other methods must be tried in order that this most valuable food fish shall continue to inhabit the waters of South Carolina.

OUR OYSTER INDUSTRY

Long before the earliest American colonization the Indians had discovered the merits of the oyster as an important sea food. This shellfish continues to be one of the major fishery products, not only of South Carolina, but of the Atlantic and Gulf coasts. Its home is the creeks, coves, bays, estuaries and mouths of rivers, thriving in practically enclosed waters rendered slightly brackish by drainage from the land.

The fishing season is during the fall and winter months when the oysters are in the best condition. The popular idea of using fresh oysters during the "R" months only has no significance, however, except from the standpoint of better quality and palability. We close our season during the months of May, June, July, August and September, not because the oysters are dangerous to mankind during these months, but in order to give them protection from mankind.

Oysters are marketed alive in the shell, as shucked meats, or canned meats. Properly frozen meats may be eaten at any time during the year. The shells are frequently ground and sold for poultry feed and liming material. Tons of oyster shells are used on the beds to afford more and better material for the setting of the young oysters or "spat."

The eastern oyster is exceedingly prolific, a single female producing under favorable conditions as many as five hundred million eggs. The sexes are separate. Those less than one year old

are predominantly males, some of which later change into females.

When the temperature of the water reaches 70 F. the reproductive elements are discharged into the water, where the eggs are fertilized. Within five to ten hours after fertilization the egg has developed into a tiny ciliated larva. This free-swimming larval existence lasts for fourteen or eighteen days, during which time the larvae are distributed over wide areas by tides and currents. At the end of this period the larvae attach themselves to any clean hard surface in the water. The spawning and attachment of larvae occur in brackish water having a salt content of approximately three-fourths that of open water.

To insure a continuous and ample supply of oysters, the industry is dependent largely upon oyster culture. This is really divided into two parts: the collection and distribution of oyster seed, and the growing, fattening and harvesting of oysters of marketable size.

It requires from two and one-half to three years in southern waters for the oyster to reach a marketable size. While the age to which an oyster may live cannot be stated definitely, according to the United States Bureau of Fisheries, it is believed the eastern oyster may live at least fifteen years, during which time it may attain a size of eight or ten inches.

Under natural conditions, oysters are found in water ranging from the high water mark down to one hundred and thirty feet. A majority of the market oysters, however, are taken from between the low tide mark and a depth of thirty feet. This is the fresh raw oyster and not the oyster used for general cannery purposes. Practically all oysters used for canning are gathered from between the high water mark and low water mark.

The food of the eastern oyster consists of microscopic plants, chiefly diatoms. Minute crustaceans known as copepods, the free-swimming larvae of snails and bivalves (including the oyster), worms, rotifers, and protozoa, have been found in their stomachs, but do not constitute an important food. At present there is no known artificial food that can be used to fatten oysters.

Occasionally one finds an abnormally colored oyster, darkened or green. Both of these abnormal color conditions are, as a rule, due to the food consumed. Two types of green coloration occur: One, the result of an accumulation of copper in the meat, and the

other caused by eating an abundance of green diatoms. The abundance of copper imparts a greenish hue to the entire body. The color produced by a large number of green diatoms in the food is usually confined to the gills, and has no effect on the palatable qualities of the oyster.

The 1939-40 oyster season in South Carolina has been a most successful one. The three canneries operating in the State canned a total of 25,134,466 ounces of oyster meats, as against 21,676,164 ounces during the previous season. The raw shucking plants, of which there were nineteen, gathered during the season 61,559 bushels of oysters, which yielded 40,307 gallons of raw oyster meats. The sum of 2,695 bushels of oysters were marketed in their shells.

During the past year this department supervised the distribution of 816,494 bushels of oyster shells upon oyster bottoms along the coast. Last year 687,840 bushels were planted, thereby showing an increase this year in planting of 128,654 bushels. Seed oysters planted this year amounted to 42,312 bushels, as against 10,731 bushels last year.

CLAMS

The soft shell clam is found in gravelly mud flats of river mouths, bays, and sounds from South Carolina to Greenland, and also in Great Britian. Normally it lives between high and low tide marks, burrowing in the sand at low tide with only the tube-like syphon extending to the surface. A person walking over the sand at low tide may see little vertical spurts of water where the siphons have been suddenly withdrawn for safety.

The spawning season lasts from June through August, and during this time enormous numbers of eggs are discharged into the water, where they are fertilized. Within ten to twelve hours the egg develops into a tiny free swimming form called the larva. In a few days the larva develops shells and by the time it is 1/25 of an inch long it has all the organs of an adult clam, although it still swims freely through the water. Soon, however, it begins to attach itself for short periods to seaweed or shells, and crawls about over the bottom. At ¼ inch it is able to burrow in the bottom. The food of clams is chiefly tiny floating plants which are present in the sea water. Clams reach a marketable size of 2½ inches in about two years.

No equipment is needed for gathering clams other than a spade, and a stout heavy bladed hoe, or a long-tined digging fork or rake. Indeed, clams are often gathered by "treading." The gatherer wades through shallow water barefooted, feeling in the mud with his feet. When a clam is located in the surface mud, it is quickly dislodged by the toes, and is gathered into a bag or bucket in less time than is required to read this.

Clams have a high food value. Clam broth is easily digested. The early settlers in the Puget Sound country of our Pacific Northwest fed the first babies born in the settlement "clam juice," as milk was not obtainable, and the babies lived and thrived.

For some reason the clam industry in South Carolina remains most inactive. There just doesn't seem to be any local market of consequence and not for years has anyone attempted to establish contact with the outside markets on a large scale. Only sixty-four bushels of clams were marketed during the past year, all of these being sold in the shell. We believe that our supply is steadily increasing, however, and that in the not too distant future the clam industry in South Carolina will be revived.

TERRAPIN

The terrapin industry has shown a marked improvement during the past year. The supply is much greater and the market demand has seemingly increased very materially.

The terrapin pens purchased 2,778 terrapin from the fishermen this year as against only 1,045 during the preceding year. Terrapin shipped this year amounted to 2,137, as against 1,323 during the previous year.

Since 1933 the Board of Fisheries, with the valuable help of the United States Bureau of Fisheries, has carried out a program of promulgation of the diamond back terrapin throughout our coastal waters. The terrapin laws have been strictly enforced and in addition to this, we have been fortunate in securing from the United States Fisheries Biological Laboratory, located at Beaufort, N. C., a supply of young diamond back terrapins each year for distribution in our waters. Our allotment this year amounted to 2,000, which were distributed as follows:

1,000 at Cape Romain Migratory Bird Refuge, Charleston County
250 in Philbin Creek, Charleston County
250 in Toogoodoo Creek, Charleston County
250 in Okatie River, Beaufort County
250 between Spring Island and Calawassie Islands, Beaufort County

Six pens were licensed during the past year, two of them private or non-commercial pens and four which were operated commercially.

STURGEON

On March 21, 1940, an Act was passed by the General Assembly repealing "An Act to Declare a Closed Season for Three Years for Fishing for Sturgeon," which had been approved on the 30th day of April, 1937. Upon the signing by the Governor of the 1940 Act, the closed season for sturgeon fishing in South Carolina came to an end. Sturgeon are much more plentiful in our waters now than heretofore. From March 21 through June 30, the catch of sturgeon amounted to 861 fish, while the yield of caviar was 476 lbs. During the 1936-37 fiscal year our records show that 759 sturgeon were caught but no caviar was reported marketed.

Before the art of making caviar from sturgeon roe was discovered, sturgeon were abundant in most of the waters of the Atlantic coast. So abundant were they, in fact, that William Penn in his correspondence often commented on the incredible numbers of these giant fish that ascended the Delaware each spring. A little more than a century ago, the taking of roe for caviar began, and soon the delicious quality of smoked sturgeon was also discovered. Thereafter the numbers of sturgeon declined rapidly due to over-fishing.

Although they spend the greater part of their lives in the sea or in bays and estuaries, sturgeon, like salmon and shad, move into fresh water to spawn. During the spring the adult sturgeons slowly work their way upstream above tidewater to deposit their eggs. Nearly 2,500,000 eggs may be produced by a single sturgeon. The young hatch in about a week. The old fish return to the sea after spawning, but it is not known how long they live nor how many spawning migrations they make. The stur-

geon matures at a length of about four feet and often grow to a length of ten feet.

SPORT FISHING ON THE CAROLINA COAST

The coast of South Carolina offers any kind and type of fishing available anywhere: deep sea, off-shore, inlet, bay, tidewater, surf-casting, and pier.

The principal centers of salt water fishing are Bluffton, Beaufort, Broad River, Edisto Beach, Meggetts, Charleston, Georgetown, Pawleys Island, Murrells Inlet, Myrtle Beach and Little River. Pier fishing is found only at Myrtle Beach, which offers two piers, one 750 feet long and the other 1,050 feet out. Five kinds of bottom are found under this latter pier: sand, rock, shell, clay and mud.

Long Bay on which is found Little River, Ocean Drive Beach, Cherry Grove Beach, Myrtle Beach, Garden City, Ocean Pines Beach and Murrells Inlet, is a popular place with the sports fishermen, more than 40 different species of fish having been caught in this bay.

Dolphin, barracuda, and amberjack are caught about 8 to 10 miles off shore trolling. The best months are August and September. King mackerel, Spanish mackerel, bluefish, red drum or channel bass, are caught within a mile off shore when trolling. Bluefish is caught principally in September and October. The others are best in June and July, with channel bass running quite late. Black fish or sea bass, yellow fin trout, sailor's choice, sheepshead, black or striped drum, pompano, flounder, butter fish, whiting, red drum or channel bass, sea trout or weakfish, spotted weakfish, gray trout, croaker, Norfolk spot, speckled trout, and many other smaller fish are caught from the shore, in small boats, and from the two piers mentioned above, using artificial bait, shrimp, menhaden, shedder crab, small minnows, mullet, cut mullet, sand fleas, and fiddlers on bottom lines. Many of these are caught the year 'round, but the season proper begins in late March and extends into December.

SHRIMP

The shrimp catch for the past year dropped off materially. There was no spring catch due to two factors. Extremely heavy

fishing combined with a severe winter, resulted in the spawning supply being much depleted. The future crop depends entirely upon a successful spawning of the shrimp now remaining. For that reason the Board of Fisheries recommended to the General Assembly that the closed season within the three mile limit be extended to August 1. Our season under the law, opens on July 1.

From a survey made by the United States Bureau of Fisheries the shrimp appeared to be few in numbers. No comparable situation has ever occurred in the past history of the shrimp fishery in the states of North Carolina, South Carolina, Georgia and Florida. The catch that we show in our report was made during the fall months, before the winter freeze.

The shrimp that migrated south into Florida during the fall and winter were practically annihilated by intense fishing. The only spawning stock available therefore, are those that are now present in the waters of the various states. This group is non-migratory and all the protection afforded them will directly benefit the fishery in our State. The more of these that are allowed to spawn, the better the chance we will have of securing a normal supply this coming season. The best way to protect this greatly reduced spawning stock is by absolutely stopping all shrimp fishing during the height of the spawning season, which runs until August 1st. This emergency is one of the reasons why the Board is now requesting the General Assembly to give it the power and authority to shorten or close fish and shellfish seasons at their discretion.

A nine year study of the life and habits of the shrimp undertaken by the United States Bureau of Fisheries, in cooperation with the conservation agencies of the states in the South Atlantic and Gulf, has disclosed much that was previously unknown. The methods employed in securing this information included years of sampling the South Atlantic fishery over the entire range, the tagging of thousands of shrimp from North Carolina to Florida, the collection of eggs, larvae and young throughout the fishery, a survey of the offshore area to the 100 fathom line from Cape Hatteras, N. C. to Fort Pierce, Fla., a but recently completed survey of the creeks, rivers, sounds and outside grounds of the fishery in Georgia and North Florida, and a great store of general information acquired during the course of the investigations. Mr. Milton J. Lindner, In Charge, Shrimp In-

vestigations, and Mr. Wm. W. Anderson, Assistant Aquatic Biologist, United States Bureau of Fisheries, from whose excellent paper "The Present Status of the Atlantic Shrimp Fishery" we are now quoting, go on as follows:

"The accumulation of facts secured by the above described means shows that spawning occurs from March into September in the open waters of the Atlantic Ocean. At an early stage in their development the young shrimp move to the brackish inside waters. These inside or inland areas are the nursery grounds of the young shrimp. As the young increase in size they seek waters of higher salinities. This results in a continual movement of young shrimp from the creeks and rivers into the sounds and eventually to the outside from the summer to the next spawning season. The first of these young generally have advanced sufficiently to appear in the fishery by mid-July. As the summer progresses the influxes of the young into the fishery rapidly increase until by September the fishery is practically entirely dependent upon this group of immature shrimp. As the numbers of young increase in the fishery the numbers of spawning adults decrease and by September have practically disappeared from the fishery.

The heavy fall fishery of North Carolina, South Carolina, Georgia and Northern Florida is dependent upon the crop of young produced by a spawning but a few months previous. With the approach of winter the larger of these young move south along the coast eventually wintering off Florida between the St. Johns river and Fort Pierce, Fla. The group of young too small to undertake this migration remain to winter in the areas adjacent to their nursery grounds. These shrimp that winter on or near their nursery grounds grow but little during the cold weather as growth in a cold blooded animal like the shrimp is closely associated with temperature.

However, with the warming of the waters in the spring the small shrimp that wintered in the more northern areas begin to grow very rapidly and at the same time their sex products mature for the approaching spawning.

Prior to the middle thirties, which was before the fishery became so intense, the migrating shrimp that wintered in Florida would return to the north for spawning with the warming of the waters in the spring. In the past few years however, the

fishing during the summer, fall and winter has been so intense that the migrating group is practically annihilated. This group can no longer be depended upon for spawning. For the past several years the annual crop of shrimp has been the result of the spawning of the shrimp of the local wintering groups.

Due to the severe winter the local wintering shrimp were killed off in large numbers by the cold. Upon the shrimp now remaining in the fishery lies the burden of producing the future crop."

This Board is for conservation first of all. The shrimp industry means a lot to the coastal section of South Carolina. Perhaps the scarcity of shrimp in our waters has been a blessing in disguise, since because of it very few foreign boats thought it worthwhile to attempt to operate in our territory, thereby giving what few remaining shrimp there were a chance to spawn. For this reason we feel that we may have a better season next year than has been anticipated.

The shrimp fishery of North Carolina, South Carolina, Georgia and Florida yields from thirty to fifty million pounds of food per year for which the fishermen receive annually over a million dollars. South Carolina actually has a much larger annual shrimp production than is shown by the statistics of the United States Bureau of Fisheries for the following reason. If a boat catches 100,000 lbs. of shrimp in Georgia and 50,000 lbs. in South Carolina, Georgia receives the credit for the entire season's catch. For instance, from actual reports received from shrimp operators in South Carolina during 1938-39 our catch was 4,195,-523 lbs., whereas the Bureau of Fisheries gives us credit for only 1,250,000 lbs.

Our records show that during the past year 2,144,901 lbs. of shrimp were taken from the waters of South Carolina.

OYSTER LAND AND LEASES OF SAME

The State Board of Fisheries has the right to lease to any person, firm or corporation, portions of the bottoms for the purpose of oyster culture, not exceeding an aggregate of one thousand acres to any one person, firm or corporation, for a term not exceeding five years, at an annual rental of one dollar per acre. At the expiration of the original lease, the Board of Fisheries is required to renew this original lease for an additional term of five years at the same rate of rental, should the lessee so desire.

All leases are drawn in duplicate with blue prints attached, the original going to the lessee, with the copy being retained in our office. A complete record is kept of all leases and blue prints.

We are strongly recommending that an appropriation be provided for a survey of our entire coast in order to determine the extent of our oyster beds, both natural and cultivated, and to ascertain the location of every acre suitable for the cultivation of oysters. It is very difficult for the State to reap the full value of our oyster shores and bottoms when we have only a series of disjointed and disconnected maps rather than a complete and accurate map of all areas now producing or capable of producing oysters. We feel that such a survey would enable us to double our present leases. Oyster land lying idle and not leased is like a house standing vacant. No one reaps any benefits from either. Oyster land must be cultivated in order to produce. We feel sure that there are thousands of acres of available oyster areas in South Carolina, which if put under lease, would create income for our citizens as well as additional income to our State.

There are now 4,844.79 acres of oyster land under lease. The State received $4,650.58 in rentals from same, in addition to the impost taxes paid on the oysters which were removed from these lands.

POLLUTION OF WATERS

While there is very little additional information that we can give you on this subject, we feel that due to its immense importance it should be touched upon in this report.

The pollution present today in so many of our creeks and rivers is a serious problem in our judgment, and one that merits the attention of the South Carolina General Assembly. We have for some time, felt that the first step toward the solving of this problem should be made by the appointment or election by the General Assembly of a commission for the purpose of investigating and making a study of this situation. Until a thorough survey is made of the various causes for our stream pollution, there is nothing that can be done to correct it. It is highly probable that in some instances pollution could be completely cleared up, but where this is not possible, at least steps could be made toward minimizing such pollution in order to give some measure of protection to the fish and shellfish in our coastal waters.

CRABS

The crab industry has in a few short years developed into a major fisheries industry in South Carolina. Our crab meat plants operate approximately ten months each year, January and February being the only really inactive months. In addition to those employed in the plants, 335 persons purchased crab fishing licenses from January 1, 1940 through June 30, 1940, and since our regular Swimming Fish license also entitles the bearer of such license to participate in crab fishing, we feel sure that many more than the 335 mentioned above, are actually engaged in fishing for crabs.

The three crab meat plants which operated during the past year purchased from the fishermen 2,482,519 lbs. of hard crabs, from which the yield of crab meat was 261,784 lbs.

There were three licenses issued during the year to operators who handled soft shell crabs. The soft shell crab season runs from March to July, being of much shorter duration than the season for hard crabs. The number of such crabs marketed during the past year amounted to 2,981 dozens.

"Our Aquatic Food Animals" issued by the U. S. Bureau of Fisheries, October, 1936, gives the following facts relative to the blue crab of the eastern coast of the United States.

"The blue crab is the most important species of crab used for food on the eastern coast. It ranges from Massachusetts to the southern extremity of Texas, or even to northern South America. The Middle and South Atlantic States produce some 80 per cent of all the crabs taken in this country. Crabs are marketed as soft crabs, hard crabs in the shell, or as fresh cooked or canned meats.

The spawning season extends from about the first of June through August. At this time the tiny eggs, measuring about 1/100 of an inch in diameter, are extruded by the female, and become attached to the hairs of her abdominal swimmerets. The egg mass is called a "sponge," and the female carrying such a mass is called a sponge crab. The sponge is at first bright yellow to orange in color, but gradually loses its color so that just before the young hatch, in from 15 to 20 days, the egg mass is almost black.

After assuming the adult form, which is at about one month of age, the blue crab sheds its skin, or molts, about fifteen times before reaching maturity. At first the interval between molts is about 6 days, later the interval increases to about 13 days, while about 25 days elapse between the final molts. At the final molt, the female acquires a broad apron to replace the pointed one she had formerly. Maturity is reached during the second summer of life, or when about 12 to 14 months old. There is no evidence of molting after reaching maturity.

Mating occurs immediately after the female has molted for the last time, while she is still in a soft condition. Those individuals that mate early in the summer may lay their eggs in about two months time, but many of the females lay no eggs that season but hold them all over until the next summer when they lay two batches. It is possible that many live over the winter after that and lay again the ensuing summer. The successive hatches of eggs are all fertilized by spermatozoa received during the one mating, but retained by the female to be used as needed. Apparently, the female dies when all of the eggs are laid, or when either 2 or 3 year's old. There is little reason to suppose that the males live longer.

Crabs increase in size only at the time their shell is shed. On the average, they expand about ⅓ in size at each shedding. The new shell hardens rapidly, being fully hardened after two days. Only those taken within 24 hours after shedding are in such a condition to be marketed as "soft" crabs. There is no known method of artificially softening the shell after it has hardened."

No additional legislation concerning South Carolina's crab industry is contemplated at present by this department.

MENHADEN

South Carolina has no menhaden fishermen nor have we a factory for the handling of these fish. All of the menhaden caught in our waters are taken by operators from North Carolina, who transport their catches back to that State.

Menhaden are used in the manufacture of fertilizer and in fish meal for animal food. The oil from the menhaden is used in the manufacture of soap, paint, varnish, linoleum, oil cloth, waterproof fabrics, etc. It is also used for the tempering of steel.

Further purified, refined and mixed with cotton-seed oil, it is sold as an edible cooking fat.

Six boats and 108 non-resident fishermen were licensed to trawl for menhaden during 1939. These operators reported a combined catch of 13,765,000 fish during the season. The direct revenue to the State was $1,012.00.

LAW ENFORCEMENT

During the past year eighty-two (82) cases were made against violators of the fisheries laws. The results of these arrests were as follows:

Convictions, 55; acquittals, 10; cases pending, 9; suspended sentences, 8; from sales of confiscated property, $321.47; fines, $449.00; confiscated property left on hand at end of year, 13 nets and 1 bateau. Two gill nets and three bow nets which were being operated illegally were destroyed as being of no value and not worth bringing in.

The above mentioned facts represent only a part of the work required of each of the inspectors. They also supervise the planting of large quantities of oyster shells and seed oysters each spring, and issue hundreds of applications for licenses during the year. They make regular inspections of all seafood plants, and also see that the proper amount of impost tax stamps and tags are placed on all shipments of fishery products where same is required. They patrol closed shellfish areas and report their findings to this office monthly, a copy of each such report being forwarded by the office to the United States Public Health Service, Washington, D. C.

Each inspector has a stipulated territory but when the occasion demands, is transferred to any other territory for short periods.

BOATS

The following is a list of the boats owned and operated by this department for patrol purposes:

One Chris Craft run-about, 27 ft. long, 175 HP Gray Phantom Motor. (Charleston County)

One Mahogany boat, 16 ft. long, 24 HP Johnson Motor. (Colleton County)

One Cabin Cruiser, 48 ft. long, 65 HP Lathrop Engine. (Beaufort County)

Note: This boat is now being used in connection with the United States Bureau of Fisheries' experimental oyster farm.

One Cabin Cruiser, 27 ft. long, 40 HP Gray Engine. (Beaufort County)

One Cabin Cruiser, 39 ft. long, 40 HP Lathrop Engine. (Charleston County)

One Cabin Cruiser, 26 ft. long, 40 HP Gray Engine. (Georgetown County)

One Gibbs Sea Skiff, 14 ft. long, 9 8/10 HP Johnson Sea Horse Motor. (Horry County)

One Thompson TVT Sea Model, 14 ft. long, 22 HP Johnson Motor. (Beaufort County)

One 16 ft. oyster boat, 5 HP Johnson Sea Horse Motor. (Jasper County)

REQUESTS

1. We request that the General Assembly pass an Act changing the open season on shad fishing from January 16 to March 25, below the forty-mile limit, and to April 30, above the said forty-mile limit, to from February 1 to March 25, and that this Act be made to apply to the entire State. This would mean that the closed season on shad fish would be effective in all of the waters of South Carolina at the same time and would greatly simplify the enforcement of the law, as well as allowing shad to spawn properly in our streams.

2. The present law requires that shad sets be placed not closer than two hundred (200) yards apart. We ask that this be changed so as to prohibit sets being placed closer together than four hundred (400) yards.

3. That the Board of Fisheries be given the power to employ all District or Assistant Inspectors and to dismiss them when their services are not necessary. It is impossible to obtain the maximum efficiency from men whom you have no power to discharge for non-performance of duty.

4. That the price of the Swimming Fish license for residents of South Carolina remain at $2.50 but that this law be amended

so as to provide for a $5.00 license fee for non-residents. The Swimming Fish license allows the person purchasing same to fish for market for all salt water fish, with the exception of sturgeon.

5. We renew and urgently recommend that a tax of five (5c) cents per gallon be imposed on all raw oysters sold in South Carolina, and a tax of two (2c) cents on each sixty (60) ounces of canned oysters sold in South Carolina. These are the present taxes on South Carolina oysters and it is only fair to South Carolina producers that it be passed, so as to bear equally on imported oysters.

6. That a law be passed authorizing the State Board of Fisheries to issue a General Canners' License, the price of which would be $25.00 per annum.

7. That an Act be passed placing a license of $4.50 on each Barge or Lighter used in gathering oysters, of less than five (5) tons. That a license of $15.00 be placed on each Barge or Lighter used in gathering oysters, of five (5) tons and over.

8. That an Act be passed increasing the following licenses:

Shrimp Canners' License.....from $1.00 to $5.00
Raw Oyster-in-Shell Shippers' License....from $1.00 to $5.00
Raw Oyster Shucking Shed License.....from $1.00 to $5.00
Oyster Canners' License.....from $1.00 to $5.00
Clam Canners' License.....from $1.00 to $5.00

9. We ask that a law be passed requiring a license on all Drag or Haul seines, as follows:

On all Drag or Haul seines up to and including 100 yards, the sum of $2.50; on all Drag or Haul seines of a length over 100 yards and not over 200 yards, $7.50; and on all Drag or Haul seines of a length exceeding 200 yards, the sum of $7.50 plus the sum of $10.00 for each 100 yards or fractional portion of 100 yards, in excess of the first 200 yards.

We ask further, that for any violation of this Act, a penalty of not less than $50.00 fine or thirty days' imprisonment be imposed.

10. That the Board of Fisheries be allowed to retain and use for its operation and for the conservation and propagation of the various fisheries industries, the revenue obtained through

it. This would be in line with the policy now in force for the operation of the State Game Department, etc.

11. We recommend that 1936 Act No. 714, as amended by 1937 Act No. 243, Providing For and Requiring Boats Licensed to Trawl for Shrimp to Carry Registration Numbers, be repealed, as we find that it is impossible to enforce same for the reason that the size of the numbers required are too large for the space on cabins and it would be useless to put the numbers on the decks of the said boats.

12. Repeal Proviso, clause in Section 3330, as amended by Act No. 896 of 1936:—conflicts with rights of lessees of bottoms and Code Sections 3341 and 3357, making offense larceny.

13. Clarify Code Section 3343 so as to remove doubt as to whether planting of required amount of shell is per acre or per lease.

14. Add to Code Section 3349 the words "or Register of Mesne Conveyance, as the case may be"—following the words Clerk of Court.

15. Amend Act No. 896 of 1936 (Code Section 3359), by striking therefrom the words "heritable or" and "heirs or" so as to remove confusion as to the character of leasehold rights. Personal property not real estate.

16. Amend Code Section 3365 by providing more deterrent penalty than mere forfeiture of license. Make the offense a misdemeanor.

17. Amend Code Section 3366 by changing the word "quarts" to gallons. Since all of our tax records, stamps, etc. are based upon gallons.

18. Amend Code Section 3374 (Amended Act No. 105 of 1933 and Act No. 347 of 1937) by placing the same tax on raw oysters imported into South Carolina as demanded of such oysters originating in this State.

19. Amend Code Section 3377 (Amended Act No. 133 of 1937), by striking therefrom the proviso, the last sentence—so that a license shall be required of those who fish for market sales.

20. Amend Code Section 3380 (Amended Act No. 816 of 1936), by requiring each applicant for license to fish for market to disclose his *nationality* as well as age, color, etc.

21. Amend Code Section 3388 by adding the words "or other fisheries products" after the words "buying clams or oysters."

22. Amend Code Section 3408 (Amended Act No. 735 of 1938), by changing the closed season on shrimp from March 1 to July 1 to from July 1 to October 1.

23. That the Board be given the authority to declare a closed season or shorten the established season for fishing, in any area, location or the whole of the coastal section, whenever in its sound discretion such change might be of benefit to the State.

All of which is respectfully submitted.

J. M. WITSELL, *Chairman*,
W. B. RYAN, JR., M. D.,
W. P. LEWIS.

Attest:

LOUISE M. BUSSEY, Secretary,
Charleston, S. C., June 30, 1940.

Appropriation for fiscal year, July 1, 1939-June 30, 1940		$24,475.00
Amount of Appropriation spent during this period	$23,665.58	
Amount of Appropriation not spent	809.42	
		$24,475.00
Receipts: July 1, 1939-June 30, 1940		$25,374.76

	1938-39	1939-40	
Shrimp Caught (lbs.) gross, heads on	4,195,523	2,182,734	+308.781
Shrimp (lbs.) yield, heads off	2,518,544	1,315,997	776,723
Oysters in shell (bus.)	619,451	715,778	613.928
Oysters, raw shucked (gals.) yield	37,936	40,307	37853
Oysters, canned (ozs.) yield	21,676,164	25,134,466	- 3341/138
Shad, white	16,031	14,932	- 12.476
Shad, hickory	3,659	8,186	- 2.558
Terrapin (number caught)	1,045	2,778	- 2257
Terrapin (number shipped)	1,323	2,137	- 1088
Oyster shell planted (bus.)	687,840	816,494	- 134.287
Seed Oysters planted (bus.)	10,731	42,312	18.147
Sturgeon (no.)	111	861	- 567
Oyster land under lease (acres)	4,822.90	4,844.79	- 4685.54
Clams (bus.)	47	64	- 460
Crab meat (lbs.)	120,928	261,784	- 341.434
Soft Shell Crabs (doz.)	1,924	2,981	- 1921
Caviar (lbs.)	36	476	- 61½
Menhaden (no. of fish)	6,530,000	13,765,000	- 10650.000

Oyster land leased (acres) 4652.28